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MEIOFAUNA OF THE VENEZUELA BASIN.(U)
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FINAL REPORT

Meiofauna of the Venezuela Basin

Submitted by:

John H. Tietjen
Department of Biology
City College of New York
Convent Avenue at 138th St.
New York, N.Y. 10031

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Introduction

Study efforts were focused on quantitative determinations of meiofauna (herein defined as benthic metazoans that pass through a sieve with a mesh opening of 0.500 mm and which are retained on a sieve with a mesh opening of 0.044 mm) that occur in three different sedimentary regimes in the Venezuela Basin. The vertical distributions of meiofauna in each sediment were examined to a depth of 10 cm to establish the existence of significant vertical differences in meiofauna densities. Biomass determinations of total meiofauna were made, and a detailed taxonomic study was also made of the Nematoda, the most dominant taxon, for the purposes of examining population structure in each sedimentary type. The three sedimentary regimes consisted of ~~1~~, a calcareous ooze; ~~2~~, a hemipelagic ooze; ~~3~~, a turbidite. The coordinates, depths, and types of sediment are given in Table 1.

Table 1. Coordinates, depths, and sediment type of the study locations in the Venezuela Basin.

Sediment type	Depth (m)	Latitude	Longitude
Pelagic calcareous ooze	3840	15° 14.7 ' N	69° 14.7 ' W
Hemipelagic	4883	13° 45.0 ' N	67° 39.9 ' W
Turbidite	3420	13° 25.6 ' N	64° 47.7 ' W

Methods

Box core samples of the pelagic ooze were taken in November 1979; samples of the remaining sediments were obtained in July 1980. Aliquots of sediment from each box core were taken with 10 cm^2 area subcores. For the calcareous ooze, subcores were sectioned vertically at 2 cm intervals; for the hemipelagic and turbidite sediments subcores were sectioned vertically at 1 cm intervals. All subcores were sectioned to a depth of 10 cm. For the calcareous ooze we obtained two box cores, each of which yielded three separate subcores (total of six); for the other two sediments we obtained two box cores which each yielded four separate box cores (total of eight subcores for each sediment). The samples were sectioned on board ship and immediately preserved

in buffered 8 % seawater-formalin, to which Rose Bengal (0.5 gm/l) was added. Subcores were taken from near the center of the box core at 2-3 cm distances from each other. Because the sediments in the box cores were used by other investigators as well, we were limited in the number of aliquot subcores we could obtain.

The samples were sieved in the laboratory through a nest of two sieves, the top one with a mesh opening of 0.500 mm and the bottom one with a mesh opening of 0.044 mm. After sieving the meiofauna were sorted ans enumerated to major taxon; nematodes were later identified to species.

Results

Faunal densities are given in Table 2. Nematodes were the dominant taxon, accounting for 88, 72.5 and 83 % of the total individuals in the turbidite, hemipelagic and pelagic sediments, respectively. Harpacticoids (7.5, 9.8, and 10.1 % in turbidites, hemipelagics, and pelagics, respectively) were the only other organisms commonly found. The remaining taxa (mostly nauplii) accounted for an average of 9.7 % of the meiofauna. Faunal densities are within the range reported for most other deep sea regions (Thiel 1975), although they are about one order of magnitude lower than those of the Norwegion Sea (Dinet 1979).

Dry weight meiofauna biomass estimates for all three sediments are given in Table 3. Nematodes comprise 78.6, 80.0 and 65.0 % of total meiofauna biomass in the turbidite, hemipelagic and pelagic sediments, respectively. The lower value for the pelagic sediments was due mainly to the small individual sizes of the nematodes; coarse sediments are often dominated by small nematodes that slide through the interstitial spaces. The range of biomass thus far estimated is well within that reported for other deep-sea regions (Thiel 1975); the hemipelagic sediments, because they contain the highest population densities, have the highest biomass.

Horizontal and vertical dispersion of total meiofauna within and between box core samples at each station have been analyzed using a three-way, mixed model, factorial analysis of variance. The three components of the analysis were sediment depth, box cores, and subcores, with box cores and subcores as random and depth as fixed factors. Because variances among means were heteroscedastistic, faunal density data were transformed (log x + 1)to make the data homoscedastistic. The ANOVA indicates that significant vertical differences

in total faunal densities exist in all three sediment types (for turbidites, $F = 10.462$, $p < .01$; for hemipelagics, $F = 42.232$, $p < .001$; for pelagics, $F = 32.603$, $p < .001$); highest densities occur in the uppermost 2 cm of sediment. For both the pelagic and turbidite sediments no significant differences occur either within or between box core samples; for the hemipelagic sediments significant differences are found both within box core samples ($F = 23.65$, $p < .05$) and between the two box cores ($F = 55.765$, $p < .01$).

The relative abundances of the nematode families found in the turbidite and calcareous sediments are given in Table 4 (a table giving individual species distributions would be too long for this report. Two families (Desmoscolecidae and Monhysteridae) were abundant in all sediments; however, each sediment was dominated by one additional family (the turbidite and hemipelagic by the Oxystominidae, the calcareous sediment by the Desmodoridae). No analyses of the spatial dispersion patterns of individual species have yet been made.

Species diversity (Shannon Wiener H') is high (Table 5), due to the fact that species dominance (J'; Pielou 1969) is low and richness (SR; Margalef 1958) is high.

Preliminary Conclusions. Faunal densities and biomass are within the ranges reported for other deep-sea regions. Significant vertical decreases in faunal density with increasing sediment depth are also consistent with the findings in other regions (Tietjen 1971; Thiel 1975; Coull *et al*. 1977). There are not enough data to establish whether the differences observed in horizontal dispersion patterns among the three sediment types are consistent, or what may account for these differences. Sediment granulometry, total macrobenthic densities, and species composition are being examined.

The high dominance of the nematode family Oxystominidae in the finer hemipelagics, and turbidites, and of the family Desmodoridae in the calcareous ooze, is consistent with what was found by Tietjen (1976) for the nematodes on the continental slope off North Carolina, and may be associated with their feeding habits.

The Oxystominidae possess small (1 - 3 μm in diameter) buccal cavities, and feed by ingesting small particles by the sucking power of the esophagus. The Desmodoridae usually have larger (3 - 10 μm) buccal cavities that are armed with small teeth; they feed primarily by scraping bacteria and other organic particles off coarser sediments. The high species richness and low dominance of the nematodes in the Venezuela Basin agrees with the high diversity of nematodes that occurs on the North Carolina slope (attributed by Tietjen, 1976, to high environmental predictability). Nematode richness in the Venezuela Basin is higher than on the North Carolina slope; the cause of this is unknown at this time.

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Table 2. Population densities of meiobenthos (number per 10 cm^2) in turbidite, hemipelagic and pelagic sediments, Venezuela Basin, July, 1980. * Other meiofauna include ostacoda and pelecypoda.

	CORE NUMBER																					
			Turbidites								Hemipelagics								Pelagics			
Taxon	11-1	11-2	11-4	11-5	16-1	16-2	16-4	16-5	17-1	17-2	17-3	17-4	18-1	18-2	18-3	18-5	3-1	3-2	3-3	5-1	5-2	5-3
Nematoda	63	33	32	45	21	12	59	27	109	104	92	116	90	82	65	89	79	41	49	82	86	65
Harpacticoida	1	4	5	5	1	1	5	2	13	20	10	25	6	7	7	6	6	6	2	12	7	19
Nauplii	1	2		3			3		30	2	7	10	5	4	3	5	1	2	1	5	1	6
Polychaeta		1		1	1							1				1		1		1		
Halicarida					1							1		1	3							
Kinorhyncha										1										2		
Tardigrada																					1	5
Other *										3								2		1	4	
TOTAL	66	40	37	54	24	13	67	29	152	130	109	153	101	94	78	101	86	52	52	104	[illegible]	[illegible]

Table 3. Nematode and total meiofauna biomass ($mg \bullet m^{-2}$) in tubidite, hemipelagic, and pelagic sediments, Venezuela Basin, July 1980.

	Nematode biomass	Total biomass
Turbidites		
11-1	34.74	37.24
11-2	44.43	54.43
11-4	22.04	34.54
11-5	41.44	53.94
16-1	16.17	18.67
16-2	4.12	6.62
16-4	53.24	65.74
16-5	25.54	30.54
Pelagics		
3-1	19.87	31.87
3-2	15.94	27.94
3-3	47.77	51.77
5-1	32.78	56.78
5-2	47.05	61.05
5-3	29.25	67.25
Hemipelagics		
17-1	116.28	142.28
17-2	75.47	115.53
17-3	87.22	107.26
17-4	122.69	172.76
18-1	85.24	97.43
18-2	77.44	91.56
18-3	61.10	75.37
18-5	85.47	97.57

Table 4. Relative abundances (percent of total individuals) of nematode families in turbidite, hemipelagic and pelagic sediments, Venezuela Basin, July 1980.

Nematode Family	Turbidite	Pelagic	Hemipelagic
Oxystominidae	21.0	5.1	19.6
Leptosomatidae	1.2		1.4
Enoplidae	0.6	0.5	0.9
Tripyloididae		0.5	1.0
Sphaerolaimidae	4.5		2.7
Phanodermatidae		0.4	1.4
Oncholaimidae		0.6	
Enchelidiidae	1.7		1.0
Ironidae		0.5	0.7
Cyatholaimidae	7.3	6.3	6.4
Chromadoridae	5.2	2.1	5.1
Comesomatidae	3.4	5.7	7.2
Choniolaimidae	1.1	2.6	0.9
Desmodoridae	3.5	23.8	4.3
Desmoscolecidae	20.0	24.6	18.2
Ceramonematidae		2.0	0.5
Rhabdolaimidae	0.6	2.6	2.8
Haliplectidae	0.6	3.2	1.8
Leptolaimidae	0.6	0.5	3.3
Axonolaimidae	2.4	2.1	1.9
Siphonolaimidae	0.6		1.0
Linhomoeidae	8.0	5.0	5.2
Monhysteridae	17.7	11.9	11.[illegible]
Rhaptothreidae			0.5

Table 5. Species diversity (H'), evenness (J') and richness (SR) of nematodes in the turbidite, hemipelagic and pelagic sediments, Venezuela Basin, July 1980.

Sediment type	H'	J'	SR
Turbidite	4.11	0.80	14.34
Pelagic	3.81	0.88	10.11
Hemipelagic	4.12	0.92	16.20


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